

(54) PLANT GROWING MEDIUM
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(57) Where throughout the specification and claims reference is made to bark or bark particles being in a green or substantially green condition, this is defined as bark or bark particles which have been removed from a tree or log while sap is still present in the tree or log, so that natural moisture or sap from the tree or log is still present in the bark or bark particles. That is to say, the bark or bark particles at the time of extraction of at least some phenolic material therefrom, are green or fresh, and have some sap present therein, and are not dried or deteriorated. Claim 1. A growing medium for plants, including comminuted bark from which at least some phenolic material has been extracted by water or aqueous solution, elevated to a temperature above ambient, while the bark was in a green or substantially green condition (as hereinbefore defined).

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Complete Specification for the invention entitled:

GROWING MEDIUM FOR PLANTS

The following statement is a full description of this invention, including the best method of performing it known to applicant(s):

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This invention relates to a growing medium for plants and ~~to a method of forming such a medium, and more particularly to the manufacture of a growing medium for plants therefrom.~~

At the present time many bonding and sizing agents, particularly those exhibiting good resistance to water, are synthesized from chemicals which are becoming expensive and more difficult to obtain, due principally to greater emphasis being placed on reducing environmental pollution and the increasing cost of petroleum from which many of them are derived. Phenolic materials are known to produce resinous polymer substances when reacted with aldehydic materials or aldehydic donor materials and this reaction is the basis of many bonding and sizing agents at the present time. It has been known for many years that an alternative source of these phenolic materials is some vegetable matter, such as for example the bark of trees which is available in substantial quantities. Such bark is of course a waste product of forest industries and indeed our New Zealand patent specification No.121967 describes the extraction of phenolic materials from bark and the use of these in the manufacture of hot pressed boards, such as for example particle boards. However, in spite of New Zealand patent specification 121967, no commercial exploitation of phenolic materials extracted from bark in this way has resulted and it has been found by many experimenters that commercial exploitation is thwart with difficulties which have hitherto not been satisfactorily overcome.

Our Australian patent specification No28884/77 from which this invention is divided out describes and claims these difficulties and provides means by which they may be overcome



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- or at least minimized, to enable useful phenolic extracts to be prepared from bark. The bark is disintegrated to a particulate form and treated with water or an aqueous solution to produce a phenolic extract component and a bark by-product
5. which may be used as a growing medium for plants. This is described in our Australian patent specification No. 28884/77.

- At the present time bark is used only as a low grade fuel, and occasionally as a landscaping material where it has been found useful in reducing the growth of vegetation around shrubs
10. trees and the like. Although containing plant nutrient material the phenolic materials contained in the bark provide conditions in which much plant life will not grow. If some of the phenolic materials are extracted for example, as described in our Australian patent specification 28884/77, the resultant
15. bark by-product becomes suitable for use as a growing medium for plants.

It is therefore an object of this invention to provide a growing medium for plants.

- Other objections of this invention will become apparent
20. from the following description.

- Where throughout the specification and claims reference is made to bark or bark particles being in a green or substantially green condition, this is defined as bark or bark particles which have been removed from a tree or log while sap is still
25. present in the tree or log, so that natural moisture or sap from the tree or log is still present in the bark or bark particles. That is to say, the bark or bark particles at the time of extraction of at least some phenolic material therefrom, are



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green or fresh, and have some sap present therein, and are not dried or deteriorated.

According to this invention, there is

5. provided a growing medium for plants including comminuted bark from which at least some phenolic material has been extracted by water or aqueous solution elevated to a temperature above ambient, while the bark was in a green or substantially green condition (as hereinafter defined).

10. The invention will now be described by way of example only, with reference to the accompanying graph which shows the relationship between phenolic material extracted from the bark particles and the duration of treatment time employed. It will be appreciated however that the graph is an example only and
15. that the values will depend upon factors such as the nature of the aqueous extraction solution employed, the temperature, and the species of tree from which the bark is derived. The graph is intended to show that most of the phenolic material available from the bark is extracted using relatively short
20. treatment times and treatment times of long duration are not necessary.

Although the bark of trees varies considerably in composition according to species, it contains significant

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amounts of elements necessary for plant growth, including calcium, magnesium, potassium, phosphorus and nitrogen.

- It is generally unsuitable for use as a growing medium for plants however because phenolic compounds contained in the bark produce conditions of pH and toxicity to bacteria necessary for good plant growth, which many plants will not tolerate. There are some exceptions to this such as orchids for example, particularly epiphytes which grow in bark in their natural habitat, and cymbidiums which we have successfully grown in bark rich mixtures, but bark is not suitable for use as a growing medium for plants generally without treatment.
- 5.
- 10.

- Bark contains substantial amounts of phenolic material, also referred to as tannins in the art, with a range of molecular weights. The lower molecular weight phenolic material which is undesirable when the bark is to be used as a growing medium for plants may be extracted, using an aqueous extraction solution, rendering the bark more suitable for use for this purpose. The extracted phenolic material may be used for purposes such as bonding or sizing agents as described in our Australian patent specification 28884/77.
- 15.
- 20.

The extraction of phenolic material from bark renders the bark more useful as a growing medium for plants.

- 25.
- To extract undesirable phenolic material from the bark, it is first comminuted to a suitable size by such methods as hammer milling, disc refining or other suitable means. The comminuted bark is then treated with an aqueous extraction solution consisting in at least water elevated to a temperature above ambient. After treatment the bark particles are separated

from the aqueous extraction solution by decanting, pressing or the like for use as a growing medium for plants. As previously explained, the solution may be used in the production of bonding or sizing agents.

5. Although the extraction solution may be water it is preferred that the aqueous extraction solution contains at least one suitable compound to assist in extraction of the phenolic material from the bark particles. Suitable compounds which facilitate extraction include; sodium sulphite, sodium bisulphite, 10. sodium metabisulphite, sulphur dioxide, potassium sulphite, potassium bisulphite, potassium metabisulphite, ammonium sulphite, sodium carbonate, sodium bicarbonate, potassium bicarbonate, sodium hydroxide, potassium hydroxide, ammonium hydroxide, ammonium carbonate and ammonia for example.
15. The suitable compound or compounds may be added to either the bark particles or to a slurry prepared by mixing bark particles with water. The aqueous extraction solution, particularly when suitable compounds are incorporated has been found suitable for extraction of phenolic material from several 20. batches of bark particles, until it contains near 6 percent by weight of phenolic material.

- After removal of phenolic material from the green or substantially green bark particles conditioning and/or fertilising materials (fertilising materials being hereinafter defined 25. as compounds including one or more of the elements nitrogen, phosphorus, and potassium) may be mixed with the treated bark particles, it being appreciated that blends of treated bark, conditioning materials or additives and/or fertilising materials may be adjusted to suit a particular species of plant,

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as the requirements of plants vary. For the purpose of description and definition, conditioning materials or additives^{is} ~~should~~ be defined as those materials such as vermiculite and expanded perlite which are added to improve or enhance physical

5. properties of the growing medium, without significantly contributing to nutrient content of the medium. For example, conditioning materials or additives such as vermiculite and expanded perlite can enhance properties of density, friability, drainage and the like.

10. Referring to Figure 1 it will be seen that there is no advantage in very prolonged durations of extraction as most of the available phenolic material is extracted from the bark particles during the earlier part of the treatment, at least before 120 minutes have elapsed and usually well before 60 minutes
15. have elapsed.

- The preferred form of processing the bark particles will now be described by way of example. Bark particles, passing in one direction through an extraction system are treated with an aqueous extraction solution passing through the extraction
20. system in the opposing or counter direction so that bark particles are introduced to the system at the end where the aqueous extraction solution containing extracted phenolic material emerges and treated bark particles emerge from the system at the end where aqueous extraction solution is introduced. This
25. counter current extraction system is more fully described in our Australian patent specification No.28884/77. The aqueous extraction solution may for example contain sodium carbonate and sodium sulphite, or other suitable compounds, and after passing completely through the extraction system may contain



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near 4 to 6 percent by weight of phenolic materials which may be recovered for use as bonding or sizing agents. The bark particles may after passing through the extraction system have near 20 to 25 percent by weight of phenolic material extracted from them, particularly the lower molecular weight phenolic material which is undesirable when the bark particles are to be used as a growing medium for plants according to the invention.

The invention is suitable for use with the bark derived from many species of tree including Pinus ponderosa, Pinus ellioti, Pinus pinaster, Pinus pseudotsuga taxifolia, Pinus radiata, Eucalyptus regnans and Eucalyptus delegatensi for example.

It will be seen that the invention is particularly useful in employing a waste product of forest industries for the manufacture of a growing medium for plants, especially if it is employed in association with the extraction of phenolic materials from the bark of trees for use as bonding or sizing agents.

This invention has been described by way of example only, and it should be appreciated that modifications and improvements such as the use of alternative compounds, and the like, can be incorporated into the invention, without departing from the scope thereof, as defined by the appended claims.

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The Claims defining the invention are as follows:-

1. A growing medium for plants, including comminuted bark from which at least some phenolic material has been extracted by water or aqueous solution, elevated to a temperature above ambient, while the bark was in a green or substantially green condition (as hereinbefore defined). ^{3/21-4/2}
2. A growing medium as claimed in claim 1 wherein the bark has been comminuted, following removal from trees.
3. A growing medium for plants as claimed in claim 1 or claim 2, including at least one conditioning additive (as hereinbefore defined).
4. A growing medium as claimed in claim 3 wherein the conditioning additive is selected from vermiculite, expanded perlite and mixtures thereof.
5. A growing medium as claimed in any one of the preceding claims 1 to 4, including at least one fertiliser material (as herein ^{defn 6/24-} defined).
6. A growing medium as claimed in any one of the preceding claims, substantially as hereinbefore described.

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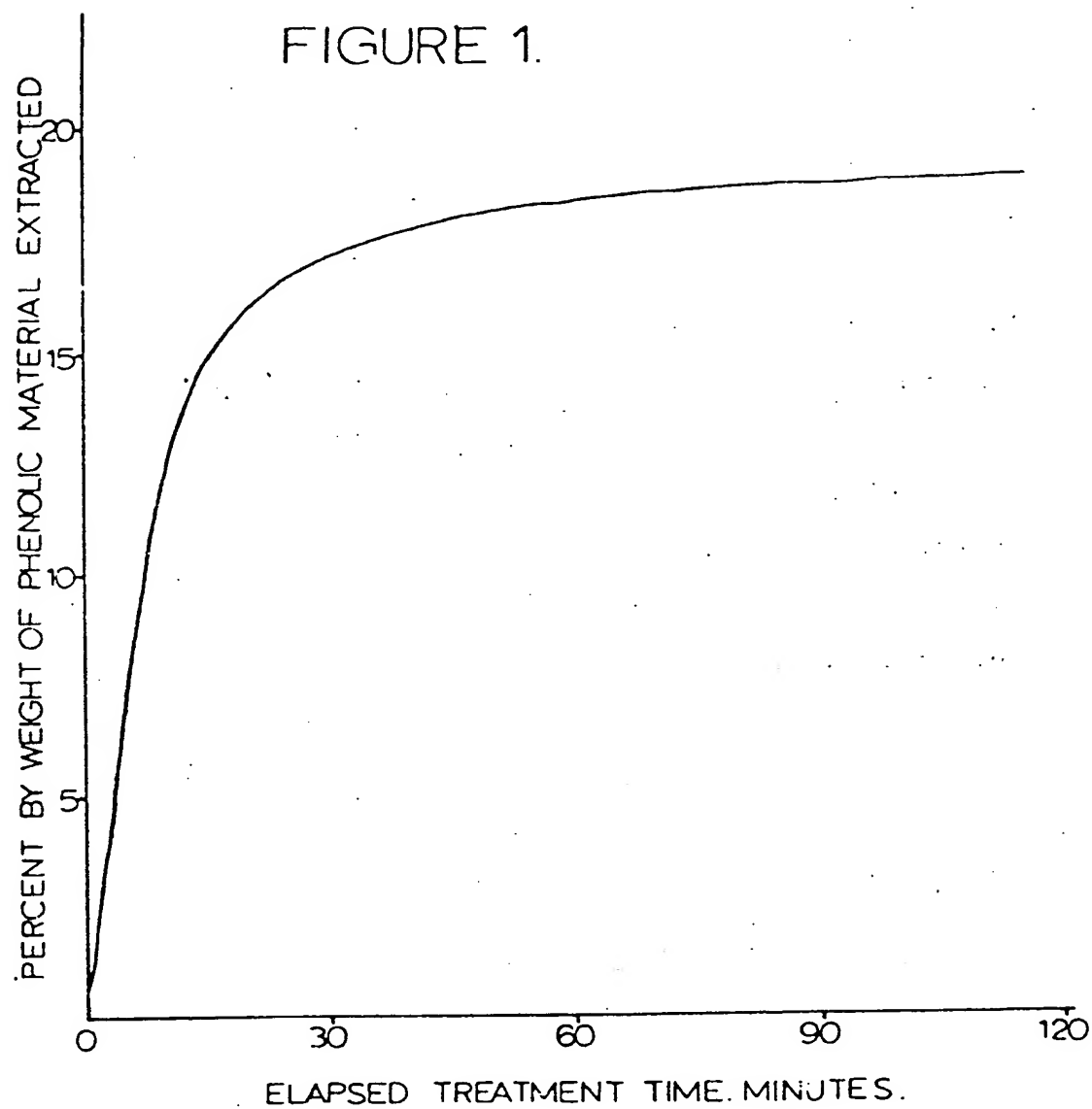
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FIGURE 1.



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